

Land Disposal Restriction Treatment Standards

ENVIRON Corporation
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Regulatory Overview

40 CFR Part 268

- + Statutory basis: Section 3004(d) - (m)
- + Banned land disposal of hazardous waste unless treated to substantially reduce its toxicity or mobility
- + Purposes
 - Minimize threats to human health and the environment
 - Promote waste minimization

Regulatory Overview

40 CFR Part 268

+ History of LDR Program

- Solvents and dioxins (1986)
- California list wastes (1987)
- Scheduled wastes: First, Second, Third Thirds (1988 - 1990)
- Newly listed or identified wastes: Phases I, II, III (1992 - 1996)

+ Recent changes

- Phase IV (63 FR 28556, May 26, 1998)

Definition of Hazardous Waste

40 CFR 261.3

- + Solid waste, unless excluded
- + Characteristic (D001 - D043)
- + Listed (F, K, P, U)
- + Mixture or derived-from rule
- + Contained-in policy (not codified)

Hazardous Waste Determinations

40 CFR 262.11

+ Generator determines if waste is:

- Excluded
- Listed
- Characteristic

+ Waste characterization based on:

- Testing
- Knowledge

Hazardous Waste Determinations

Basic Requirements

- + **Testing for characteristics**
 - Ignitability, reactivity, corrosivity
 - Toxicity characteristic
- + **Representative sampling**
- + **Analytical methods**

Hazardous Waste Determinations

Treatment Considerations

- + Universal treatment standards (UTS)
- + Underlying hazardous constituents (UHCs) are constituents listed in the UTS Table that are:
 - Reasonably expected to be present
 - At the point of generation
 - At a concentration above the UTS
- + Recent changes (Phase IV rule)

Hazardous Waste Determinations

Example

- + 1,400 yd³ of waste buried in a vault
- + Waste to be excavated for off-site land disposal
- + Waste is not excluded or listed
- + Characterization to determine if RCRA hazardous waste
- + 1 sample per 50 yd³ (28 samples total)
- + Analyze for full toxicity characteristic leaching procedure (TCLP) and target compound list (TCL)

Hazardous Waste Determinations

Example

- + All TCLP results exceeded TCLP limit for arsenic (5.0 mg/L)
- + No constituents on TCL exceeded UTS
- + Waste is RCRA hazardous (D004)
- + No UHCs
- + Waste must be treated to meet D004 treatment standard prior to land disposal; treatment for other UHCs not necessary

LDR Treatment Standards

- + General concepts
- + Technology basis
- + Compliance
- + Media-specific treatment standards
 - Hazardous debris
 - Hazardous contaminated soil

LDR Treatment Standards

General Concepts: 40 CFR 268.40

+ Waste treatment categories

- Wastewater (WW): <1% TOC and <1% TSS
- Nonwastewater (NWW): not a WW

+ NWW treatment standards expressed as:

- Concentration in waste (total; mg/kg)
- Concentration in waste extract (TCLP; mg/L)
- Treatment technology

LDR Treatment Standards

Nonwastewater Examples

Waste Characterization Results (Nonwastewater)	Hazardous Waste Code(s)	Treatment Standards for Hazardous Wastes (40 CFR 268.40)
TCLP arsenic > 5.0 mg/L; no UHCs	D004	5.0 mg/L TCLP arsenic
TCLP lead > 5.0 mg/L; no UHCs	D008	0.75 mg/L TCLP lead
TCLP PCE > 0.7 mg/L; naphthalene > 5.6 mg/kg is an UHC	D039	6.0 mg/kg PCE; 5.6 mg/kg naphthalene (UHC)
Listed waste (spent stripping & cleaning bath solutions from electroplating where cyanides are used); no characteristics; TCE > 6 mg/kg is not an UHC	F009	0.11 mg/L cadmium, 0.60 mg/L chromium, 0.75 mg/L lead, 11 mg/L nickel, 0.14 mg/L silver; 590 mg/kg total cyanides; 30 mg/kg amenable cyanides
Listed waste (spent stripping & cleaning bath solutions from electroplating where cyanides are used); TCLP barium > 100 mg/L; TCE > 6 mg/kg is an UHC	F009 D005	0.11 mg/L Cd, 0.60 mg/L Cr, 0.75 mg/L Pb, 11 mg/L Ni, 0.14 mg/L Ag; 590 mg/kg total cyanides; 30 mg/kg amenable cyanides; 21 mg/L Ba; TCE 6 mg/kg (UHC)
Listed waste (WW treatment sludge from manufacturing and processing of explosives); no characteristics	K044	DEACT for reactivity (40 CFR 268.42)

LDR Treatment Standards

Technology Basis

- + Technology-based, but should not be below “minimize-threat levels”
- + Best Demonstrated Available Technology (BDAT)
- + NWW BDATs
 - Incineration for organics
 - High-temperature metals recovery (HTMR) and stabilization for metals

LDR Treatment Standards

Technology Basis

+ Treatment standards based on BDAT

- Post-treatment data
- Variability factor to account for waste and process variabilities
- Achievable for well-designed, well-operated system

+ BDAT supporting documents

LDR Treatment Standards

Compliance

- + Based on totals or TCLP, depending on the treatment standard
- + Compliance based on analysis of grab sample
- + Not necessary to monitor for entire list of UTS constituents
- + Management of treatment residuals
 - Characteristic wastes
 - Listed wastes

Treatment Standards for Debris

Definition: Debris

- + 40 CFR 268.2(g)
- + Solid material > 60 mm particle size that is:
 - Manufactured object
 - Plant or animal matter
 - Natural geologic material
- + Not debris if material has specific treatment standard elsewhere in 40 CFR Part 268
- + Primarily debris, by volume, based on visual inspection

Treatment Standards for Debris

Definition: Hazardous Debris

- + 40 CFR 268.2(h)
- + Contains a listed hazardous waste
 - On its surface
 - In its interstices, such as pore structure
- + Exhibits a characteristic of hazardous waste

Treatment Standards for Debris

Contaminants Subject to Treatment

- + 40 CFR 268.45(b)
- + Constituents identified for the listed waste
- + Constituents for which debris exhibits characteristic

Treatment Standards for Debris

40 CFR 268.45

+ Treatment standards can be either:

- Waste treatment standards in 40 CFR 268.40
- Treatment technologies in 40 CFR 268.45 Table 1

+ Technologies

- Description
- Performance and/or design and operating standard
- Contaminant restrictions

Treatment Standards for Debris

40 CFR 268.45 – Table 1

- + 17 technologies identified as BDAT

- + **Extraction technologies**

 - Physical, chemical, thermal

- + **Destruction technologies**

 - Biological, chemical, thermal

- + **Immobilization technologies**

 - Encapsulation, sealing

Treatment Standards for Debris

Basis, Compliance, Considerations

- + BDAT (see USEPA's Support Document)
- + Compliance based on certification of performance
- + Management of treatment residuals
 - Treated debris
 - Treatment residuals

Treatment Standards for Soil

Definitions

+ **Soil: 40 CFR 268.2(k)**

- Mechanically inseparable
- Primarily soil by volume
- Based on visual inspection (in the field)

+ **Hazardous contaminated soil (HCS)**

- Contains a listed hazardous waste
- Exhibits a characteristic of hazardous waste

Treatment Standards for Soil

Alternate Treatment Standards

- + 40 CFR 268.49
- + 90% reduction for all constituents subject to treatment
- + Capped at 10 x UTS
- + Constituents subject to treatment
 - Listed or characteristic constituents
 - All UHCs (even if soil contains a listed waste)
- + Option to treat per 40 CFR 268.40

Treatment Standards for Soil

Example: > 5.0 mg/L TCLP lead (D008)

Untreated TCLP Concentration (mg/L)	Alternate Treatment Standard for HCS			Treatment Standard under 40 CFR 268.40 (mg/L)
	90% Reduction (mg/L)	10 X UTS (mg/L)	Treatment Standard (mg/L)	
200	20	7.5	20	0.75
50	5	7.5	7.5	0.75
7	0.7	7.5	7.5 (no treatment required)	0.75

Treatment Standards for Soil

Basis for Treatment Standards

- + Technology-based
- + Achievability (rather than the most aggressive technology)
- + USEPA's Soil Treatment Database
 - Data used to confirm typical achievability
 - Performance data from bench-, pilot-, and full-scale technologies
 - Non-combustion technologies

Treatment Standards for Soil

Basis for Treatment Standards

- + Biotreatment (VOC, SVOC, P)
- + Chemical extraction (VOC, SVOC, PCB, mercury)
- + Dechlorination (VOC, SVOC, P, PCB, dioxin, furan)
- + Soil vapor extraction (VOC, SVOC)
- + Soil washing (SVOC)
- + Stabilization (metals)
- + Thermal desorption (VOC, SVOC, P, PCB, dioxin, furan)

Treatment Standards for Soil

Compliance with Treatment Standards

- + Reduction based on representative sample
 - Totals or TCLP, depending on the treatment standard
 - Analysis of grab sample
- + Two or more treatment trains may be required
- + Not necessary to monitor for entire list of UTS constituents
- + Management of treatment residuals

LDR Treatment Standards

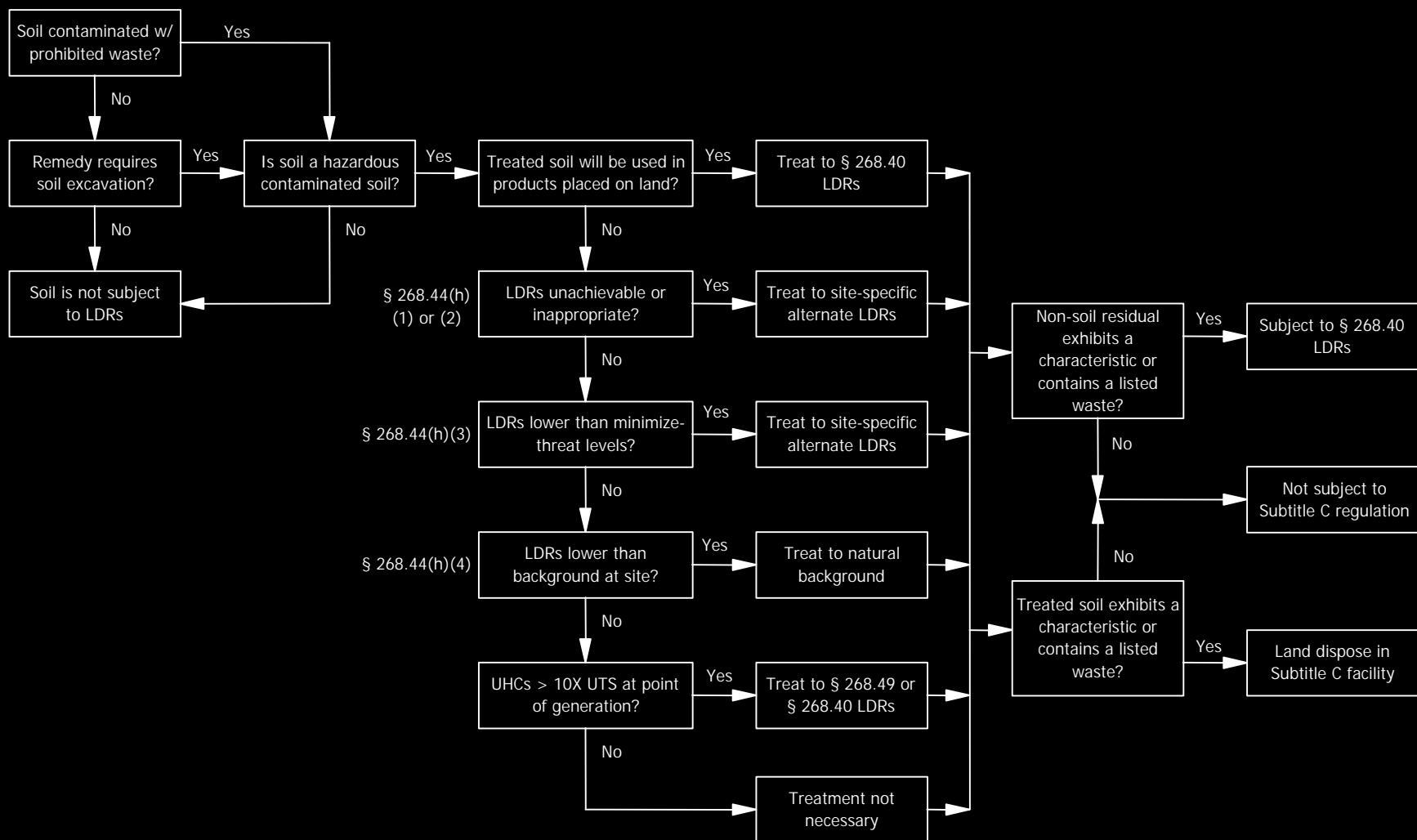
Summary

Media	Treatment Standards	Constituents Requiring Treatment
Waste	40 CFR 268.40 (numerical or technology)	CW: characteristic constituent + UHCs LW: listed constituent
Debris	40 CFR 268.45 (technology) or 40 CFR 268.40	CW: characteristic constituent LW: listed constituent
Soil	40 CFR 268.49 (90 % reduction capped at 10 X UTS) or 40 CFR 268.40	CW: characteristic constituent + UHCs LW: listed constituent + UHCs

CW = Characteristic waste

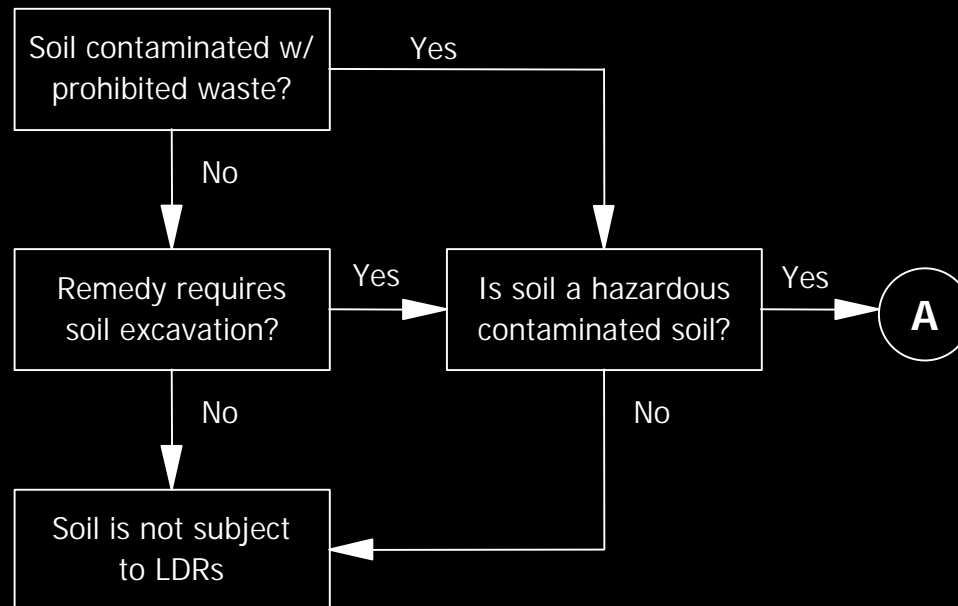
LW = Listed waste

Considerations for Remediation of Soil



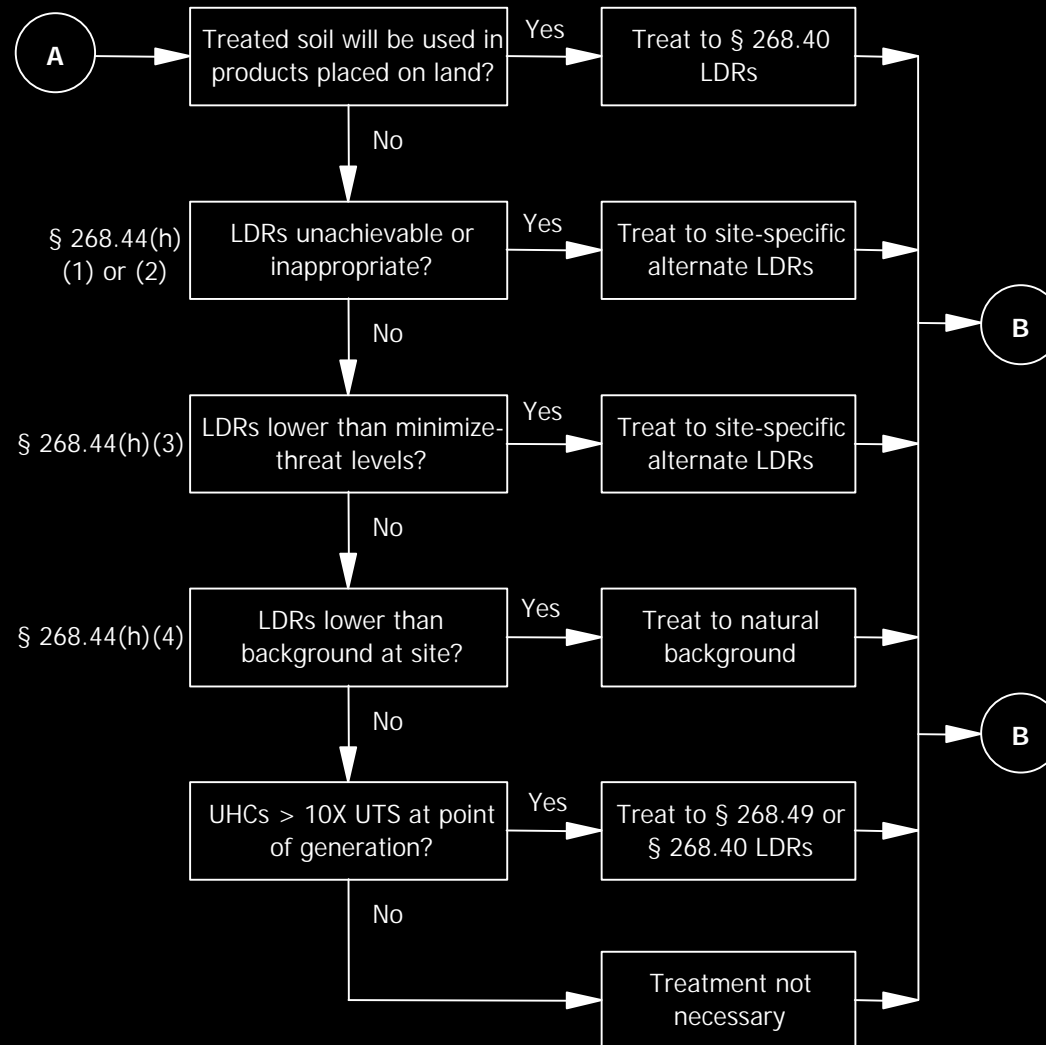
Considerations for Remediation of Soil

Are the LDR Treatment Standards Applicable?



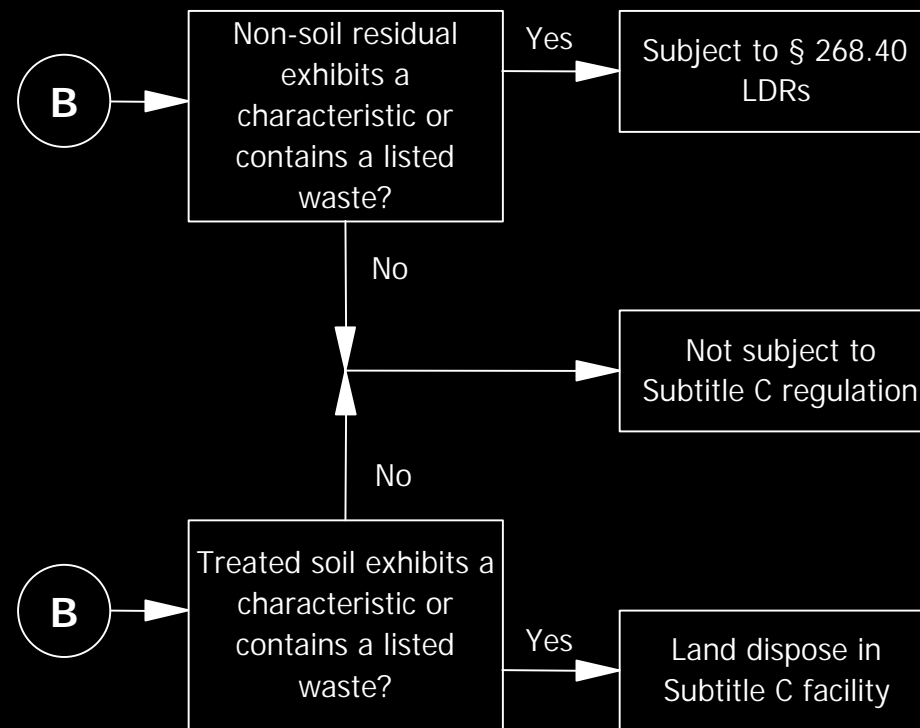
Considerations for Remediation of Soil

What LDR Treatment Standards are Applicable?



Considerations for Remediation of Soil

How must treatment residuals be managed?



Treatment Standard Variances

40 CFR 268.44

+ Generic: 40 CFR 268.44(a)

- No longer relevant to debris or soil

+ Site-specific: 40 CFR 268.44(h) allows alternate treatment standard when:

- Waste is significantly different from wastes USEPA used to develop the standard
- Treatment technology on which the standard was based is inappropriate to the waste from a specific site
- Technology-based LDRs are lower than minimize-threat levels or background (soil)

Hazardous Waste Delisting

40 CFR 260.22

- + Petition USEPA to exclude a listed waste at a particular facility
- + Required demonstration:
 - Waste does not exhibit a characteristic
 - Waste does not meet listing criteria
 - Waste is not hazardous for other reasons (risk-based determination)

Expected Changes to the LDR Program

+ HWIR Media Rule

- Proposed 4/29/96
- Expected final 10/30/98

+ HWIR Waste Rule

- Proposed 12/21/95
- Expected re-propose 10/31/99
- Expected final 4/30/01

HWIR Media Rule

- + Hazardous contaminated soil already addressed
- + “Bright line” approach for soil removed
- + HWIR media rule expected to address:
 - Streamlined permitting for cleanup sites (expedite permit process without requiring facility-wide corrective action)
 - “Staging pile” (new unit for storage of remediation waste during cleanup)
 - Exclusion for dredged materials

HWIR Waste Rule

- + Establish waste concentrations below which certain “low-risk” wastes can exit hazardous waste management requirements
- + Risk-based approach
- + Issues/difficulties:
 - Target risk levels
 - Development of nation-wide generic pathways, receptors, and media
 - Ecological risks

Additional Resources

- + **EPA Office of Solid Waste; Hazardous Waste**
<http://www.epa.gov/epaoswer/osw/hazwaste.htm>
- + **EPA Office of Solid Waste; What's New**
<http://www.epa.gov/epaoswer/osw/new.htm>
- + **EPA RCRA On-Line**
<http://www.epa.gov/rcraonline/>
- + **RCRA, Superfund & EPCRA Hotline**
<http://www.epa.gov/epaoswer/hotline/index.htm>
- + **Phase IV Rule**
<http://www.epa.gov/epaoswer/hazwaste/ldr/ldrmetal/facts.htm>